



Bibliometric Analysis of Publications on Vertebral Osteomyelitis Infections

Vertebral Osteomyelitis Konulu Yayınların Bibliyometrik Analiz Yöntemi İle İncelenmesi

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Abstract

Aim Vertebral osteomyelitis is defined as an infection of the intervertebral disc and the disc space of the adjacent vertebrae, which causes mortality and morbidity. This disease has started to be detected more frequently due to increased diagnostic possibilities. In this study, we aimed to review the contribution of the increasing number of cases to the scientific literature.

Material and Method This bibliometric analysis study was carried out by searching the keywords "vertebral osteomyelitis (VO)" or "spondylodiscitis" in Scopus database of Elsevier. English was chosen for the searching language. The distribution of the number of publications by years was evaluated in terms of the institution in which the publications were made, the language of the publication, the country, the author, the institutions providing financial support, the number of citations and the journal in which they were published.

Results It was determined that there were 2679 publications on vertebral osteomyelitis (VO). First publication was published in 1911. While there was very few publication on this subject until 1937, the number of publications after year 1980s were increased (Graph 1). A total number of 1924 (71.81%) were published after the year 2000. The authors with the highest number of articles in this field were Louis Bernard (16 publications) and Aurélien Dinh (16 publications) from France. A total number of 2576 (96.15%) publications were published in the field of medicine. There were publications on VO in 20 different disciplines, from nursing to veterinary. The publications were consisted of 2123 (79.24%) articles, 261 (9.7%) of them are not categorized, 9 (0.33%) letters to the editor, 150 (5.59%) reviews, and 136 (5.07%) other types of studies (conference papers, notes, book chapters, etc.). The dominant language of publication was English (1992, 74.35%). The most scientifically productive countries on VO were United States (n=452, 16.87%), France (n=303, 11.31%) and Germany (n=248, 9.25%).

Conclusion It is necessary to support scientific activities on VO and increase the number of publications made globally.

Keywords Vertebral osteomyelitis, bibliometric analysis, Scopus database.

Özet

Amaç Vertebral osteomyelitis mortalite ve morbiditeye neden olan, intervertebral disk ve komşuluğundaki vertebraların disk alanı enfeksiyonu olarak tanımlanır. Bu hastalık artan tanılabilirlik nedeniyle daha sık saptanmaya başlamıştır. Bu çalışmada, artan vaka sayılarının bilimsel literatüre katkısının gözden geçirilmesi amaçlandı.

Gereç ve Yöntem Bu bibliyometrik analiz çalışması Elsevier'e ait Scopus veri tabanı taraması ile gerçekleştirildi. Arama kelimesi olarak başlık kısmında "vertebral osteomyelitis (VO)" veya "spondilodiskit" anahtar kelimeleri kullandık. Arama dili için İngilizce dili tercih edildi. Yıllara göre yayın sayılarının dağılımı, yayınların yapıldıkları kurum, yazı dili, ülke, yazar, finansal destek sağlayan kuruluşlar, atf sayıları ve yayımlandıkları dergi açısından değerlendirildi.

Sonuçlar VO konusunda 2679 yayın olduğu, ilk yayının 1911 yılında yayımlandığı saptandı. 1937 yılına kadar bu konuda hiç yayın yokken, 1980'ler sonrası yayın sayısında artış olduğu saptandı (Grafik 1). Yayınların 1924'ü (%71,81) 2000 yılından sonra yayımlandı. En fazla bu alanda makalesi bulunan çalışmacılar, Fransızdan Louis Bernard (16 yayın) ve Aurélien Dinh (16 yayın) idi. Yayınların 2576'sı (%96,15) tıp alanında yayımlandı. Hemşirelikten veterinerliğe 20 farklı bilim dalında VO konusunda yayın vardı. 2123'ü (%79,24) makale, 270'i (10,07) 9'u (%0,33) editöre mektup, 150'si (%5,59) derleme ve 136'sı (%5,7) tanesi diğer tür çalışmalar (konferans bildirisi, not, kitap bölümü, vb) idi. Hakim yayın dili İngilizce idi (1992,%74,35). Amerika Birleşik Devletleri (n=452, %16,87), Fransa (n=303, %11,31) ve Almanya (n=248, %9,25) VO konusunda en bilimsel üreten ülkeler idi.

Sonuç VO konusundaki bilimsel faaliyetlerin desteklenmesi, global olarak yapılan yayın sayılarının artırılması gerekmektedir.

Anahtar Kelimeler vertebral osteomyelitis, bibliyometrik analiz, Scopus veri tabanı

INTRODUCTION

Disc space infection of the intervertebral disc and adjacent vertebrae is defined as vertebral osteomyelitis (VO) or spondylodiscitis¹.

Its incidence has increased due to the increase in life expectancy, invasive procedures, and patients receiving immunosuppressive therapy. The disease is most common in people under the age of 20 and between the ages of 50 and 70.^{1,2}

According to the microorganism causing the etiology VO is classified as pyogenic, granulomatous or parasitic². The most common form is the pyogenic form, and the agent often reaches the vertebrae by the hematogenous route. The causative agents of pyogenic VO are often *Staphylococcus aureus* or *Escherichia coli*.

Granulomatous VO usually progresses insidiously; brucellosis and tuberculosis are the most common etiologies⁽¹⁾. The agents most commonly reach the vertebral area either iatrogenically or hematogenously. Iatrogenic VO occurs as a result of epidural injection, lumbar surgery, lumbar puncture or lumbar trauma³.

The disease is typically characterized by back pain that does not respond to treatment. The diagnosis of VO is quite difficult. Magnetic resonance imaging (MRI) is frequently used in diagnosis. MRI is the gold standard imaging method with 92% sensitivity and 96% specificity⁴. It also provides visualization of abscess formation. Diagnosis is based on clinical, radiological, laboratory, microbiological and histopathological data. Treatment is based on the elimination of the causative agent with antibiotics and in some cases vertebral surgery. The goals of VO treatment are to eliminate the infection, restore the patient's functionality, and relieve pain^{1,3}. A recent study in Denmark showed that the incidence of VO increased from 2.2/100,000 per year in the year 1995 to 2008 period to 5.8/100,000 in recent years. The age-standardized incidence in Germany is

estimated to be 30/250,000/case-year based on data from the Federal Statistical Office. This increase can be attributed to the development of diagnostic methods or increased awareness of the disease in recent years⁴.

In this study, we aimed to give a vision to the researchers on this issue by evaluating the scientific literature published on VO.

MATERIALS and METHODS

This bibliometric analysis study was carried out by searching the keywords "vertebral osteomyelitis" or "spondylodiscitis" on Scopus database of Elsevier. English was chosen for the search language. The distribution of the number of publications by years was evaluated in terms of the institution in which the publications were made, the language of the publication, the country, the author, the institutions providing financial support, the number of citations and the journal in which they were published.

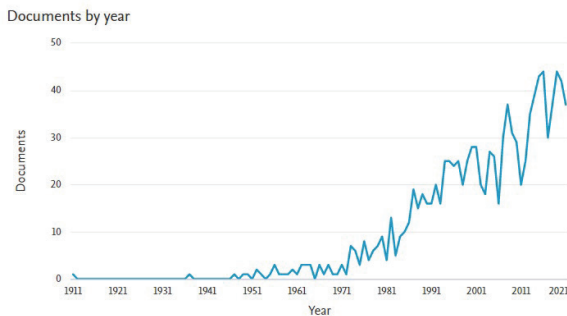
A statistical method was not used. Percentage and frequency values of descriptive data were calculated. Graphics provided by the Windows 10 program and graphics from the Scopus database were used for visualizations.

RESULTS

General analyzes

It was determined that there were 2679 publications, and the first publication was published by Fraser and McPherson in 1911⁵. While there was very few publication on this subject until 1937, there was an increase in the number of publications after the year 1980s. It was determined that 2016 and 2019 were the years with the highest number of publications (Graph 1). 1924 of the publications (71.81%) were published after 2000. The publications of 733 were published in open access (OA) journals. The authors with the most articles in this field were Louis Bernard (16 publications) and Aurélien Dinh (16 publications) from France. More than 100 researchers had publications on this subject. Publications of 137 were published in more than one

discipline; 2576 (96.15%) were in the field of medicine, 167 (6.23%) were in the field of immunology and microbiology, 74 (2.76%) were in the field of biochemistry, genetics and molecular biology. Publications were consisted of 2123 (79.24%) articles, 261 (9.7%) not categorized, 9 (0.33%) letters to the editor, 150 (5.59%) reviews, and 136 (5.07%) other types of studies (conference papers), note, book chapter, etc.). Publications of 1992 (74.35%) were written in English, 258 (9.63%) in French, 143 (5.33%) in Spanish, 134 (5%) in German and 152 (5.67%) of them were written in other languages.



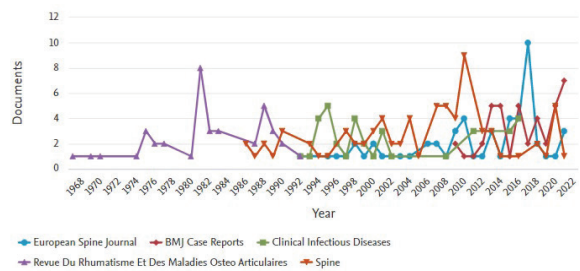
Graph 1. Number of publications by year.

The most articles on VO were published in 5 journals with the number of 76 publications in the Spine Journal, 55 in the European Spine Journal, 42 in the BMJ case reports, 39 in the Revue Du Rhumatisme Et Des Maladies Osteo Articulaires Journal and 39 in the Clinical Infectious Diseases Journal (Graph 2). AP-HP Assistance Public Hospital in Paris (France) (n=25, 0.93%), Catholic University del Sacro Cuore in Rome Campus (Italy) (n=25, 0.93%), VA Medical Center (United States) (n =20, 0.74%), Hospital Clinic Barcelona (Spain) (n=18, 0.67%), Chang Gung Memorial Hospital (Taiwan) (n=17, 0.63%) were the 5 most productive institutions in VO.

United States (n=452, 16.87%), France (n=303, 11.31%), Germany (n=248, 9.25%), Spain (n=161, 6.00%), Italy (n=156, 5.82%), Japan (n=139, 5.18%), England (n=106, 3.95%), Turkey (n=94, 3.50), Switzerland (n=72, 2.68%), and India (n=70, 2.61%) were the top 10 countries in

scientific productivity on VO.

Studies of 107 (3.99%) were supported by the funding agency. Japan Association for the Promotion of Science (n=6), National Institute of Allergy and Infectious Diseases (n=6) (USA), China National Natural Science Foundation (n=6) and Korea National Research Foundation (n=5) were the institutions that provided the largest number of funds for VO researches.



Graph 2. Distribution of the number of articles in the top 5 journals that published the most publications on vertebral osteomyelitis by years.

Citation analysis

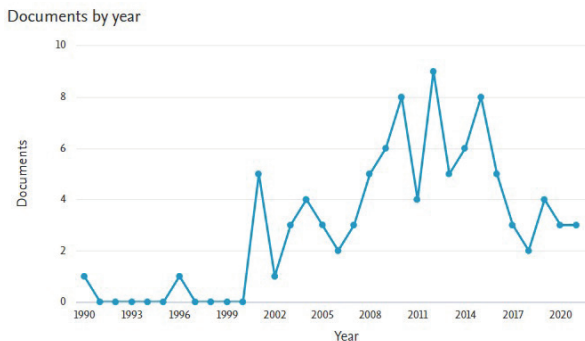
Publications of 714 (26.65%) were not cited at all. A publication received more than 500 citations; 8 publications 250, 51 publications 100, 149 publications 50, 339 publications 25, 778 publications more than 10. The analysis of the 10 most cited publications is given in detail in Table 1. The most cited article was about the effectiveness of MRI imaging of VO(6).

Table 1. Analysis of the 10 most cited publications⁶⁻¹⁵.

Author, year of publication	Journal	Citation Number	Subject
Modic et al, 1985	Radiology	548	Efficiency of MRI Imaging
McHenry et al, 2002	Clinical Infectious Diseases	402	Clinical results of patients
Gouliouris et al, 2010	Journal of Antimicrobial Chemotherapy	400	Compilation
Berbari et al, 2015	Clinical Infectious Diseases	375	Diagnosis and treatment guide
Sapico et al, 1979	Reviews of Infectious Diseases	356	Case series and compilation
Carragee EJ, 1997	Journal of Bone and Joint Surgery - Series A	349	Clinical results of patients
Zimmerli, W, 2010	New England Journal of Medicine	347	Case presentation
Mylona et al, 2009	Seminars in Arthritis and Rheumatism	325	Systematic compilation
Eismont et al, 1983	Journal of Bone and Joint Surgery - Series A	263	Clinical results of patients
Colmenero et al, 1997	Annals of the Rheumatic Diseases	262	Clinical results of patients

Turkey's Contribution

There were 94 publications from our country on our study and Turkey was in the 8th place in the whole ranking. The first publication was published in 1990¹⁶. Publications on VO from our country also increased after the year 2000, in line with the global literature (Graph 3). On VO, 14 papers from Istanbul Medical Faculty, 7 from Atatürk University, 6 from Ege University, each five papers from Atatürk Training and Research Hospital and Van Yüzüncü Yıl University and each 4 papers from Trakya University, Fırat University, Dicle University and Baskent University were published. The most productive authors from our country were Prof Dr Reşat Özaras and Prof Dr Fehmi Tabak with four articles each. The publication published in the Journal of Infection in 2007 by Assoc. Dr. Tuba Yeter Turunç was the work with the highest number of citations (111 citations)¹⁷.



Graph 3. Distribution of publications in our country by years.

DISCUSSION

Bibliometric analyzes are data analysis studies that enable the evaluation of publications, theses and scientific productivity in a field of science, and it has started to take place in the medical literature in recent years¹⁸⁻²³. There are many works in this field by the researchers from our country^{18,20,23}. With this method, the scientific literature is revealed and it may be possible to provide ideas to the researchers of the relevant subject. It is possible to make these studies from databases, which allow bibliometric data analysis, and even visualization. Scopus database belonging to Elsevier publishing house is one of these ready-made databases. In addition, it has been observed that analyzes were performed using databases such as Web of Science Core Collection (WoSCC) and Pubmed Medline in many studies¹⁸⁻²³. In this study, the Scopus database was preferred because of its richer journal content.

VO is an infectious disease known since from ancient times¹. The number of patients diagnosed with medical advances has increased, but it is a disease with unknowns²⁻⁴. Especially the increase in the possibilities in the field of radiology provides facilitates diagnosis. Although there is a limited number of bibliometric analyzes for specific VO publications in the available literature²⁴⁻²⁷, no study providing an overview was found. In this study, we aimed to give a vision to those who will work on VO with the bibliometric analysis method over the Scopus database.

As a result of the study, it was determined that the country with the highest number of publications on VO was the USA, as in almost all other bibliometric analyzes¹⁸⁻²³. In addition, the other countries with the highest number of articles on VO were France (n=303, 11.31%), Germany (n=248, 9.25%), Spain (n=161, 6.00%), Italy (n=156, 5.82%), Japan (n=139, 5.18%), England (n=106, 3.95%), Turkey (n=94, 3.50), Switzerland (n=72, 2.68%) and India (n=70, 2.61%). In a vertebral similar bibliometric analysis, it was determined that Australia and the Netherlands were in dominant positions with the main research power, establishing a cooperation relationship with Austria, Bangladesh, Germany and Switzerland. However, no collaboration analysis was performed in our current study. The reason for the highest number of publications in the current study can be attributed to the high number of researchers in the USA. Looking at the funders of the studies, 107 (3.99%) studies were supported by the funding institution, and the Japan Science Promotion Association (n=6), the National Institute of Allergy and Infectious Diseases (n=6) (USA), the National Natural Science Foundation of China (n=6) and the Korea National Research Foundation (n=5) were the largest funders for research on VO. However, studies on VO were found to be at a very low level when compared to publications in other bibliometric analyzes¹⁸⁻²³.

When the disciplines in which the publications were made were examined, it was determined that the management of this disease required a multidisciplinary approach, contributing to the VO literature from 20 different disciplines from nursing to veterinary.(cümle tekrarı olamaması adına değiştirilmiştir)

Considering the citation analysis, the article on the effectiveness of MRI in imaging the highest number of citations for VO was received⁶. This proves the effectiveness of MRI in proving the effectiveness of this groundbreaking method in both the diagnosis and treatment of VO. In addition, the increase in publications on VO after the 2000s can be attributed to the reflection of technological

developments in radiology. Another most frequently cited subject was the publications investigating clinical features (Table 1).

CONCLUSION

As a result, it is necessary to support scientific activities on VO and to increase the number of studies published in our country and globally.

Limitations of the study

A single database was searched in the study. Therefore, it may not reflect all the scientific literature on VO.

Ethics Committee Approval

Ethics committee approval was not obtained because there was no animal or human study and it was a document review study.

Declaration of Conflict of Interest:

There is only one author. The author declared no conflicts of interest with concerning to the authorship and/or publication of this article.

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